

AbstractID: 10642 Title: A Novel Technique to Generate 3D Lung Volumes from 2D Hodgkin Lymphoma Planning Datasets Using Combined Deformable Image Registration and Navigator Channels.

**Purpose:** To validate the use of deformable image registration and navigator channels (NC) to generate 3D lung volumes from 2D images, for retrospective dose calculation of Hodgkin Lymphoma (HL) patients treated with 2D planning. **Methods and Materials:** Forty-seven HL patients with 3D images were acquired. Six patients were used to construct a population lung model, which was then registered, using a biomechanical model-based deformable registration algorithm, MORFEUS, into 24 additional HL 'reference' patients to develop a lung motion model. This model was refined to describe the 3D lung volume and position of 17 HL 'test' patients, using only information in the 2D DRR constructed from 3D images. The refinement was performed by: 1) matching a reference patient to each test patient (using lung width and length measurements), 2) placing four NCs, or small regions of interest, on the lung boundary of the reference patient and automatically placing the corresponding NC on the test image in the same geometric position, 3) converting the image intensity in the NC into a 1D shift to match that location, 4) refining the lung motion model using the four 1D shifts to describe the 3D volume and position of the test patient's lung. The refined lung model was then compared to the actual 3D lung contour of the 17 test patients by computing the volume overlap. **Results:** The average percentage overlapping and non-overlapping volumes between the NC-refined lung model and test lungs were  $89.2 \pm 3.9\%$  (Right Lung=88.8%; Left Lung=89.6%) and  $10.8 \pm 3.9\%$  (Right=11.2%; Left=10.4%), respectively. NCs made a statistically significant improvement to the population lung model shape (T-test:  $p < 0.05$ ). **Conclusion:** This technique will be used to generate 3D lung volumes for retrospective patients treated with 2D planning for longitudinal studies to improve understanding of the dose-risk relationship and various late effects.